Attachment #2

Change January - Current Outstanding Major Technical Problems J-[illegible]-3 Engine 1 February 1962

Problem	Status Change Since 2 January 1962	Continuous Change Since 2 January 1962	Remains Since 2 January 1963
1. Reliability:			
1. Hydraulic Pump 25X1A 25X1A	The pump described on 2 January failed at 33 hours Mach 3 mission endurance due to mechanical rather than material reasons. An additional pump with obsolete materials failed at 23 hours Mach 2 mission endurance believed due to test rig malfunction at [redacted]. A third pump is starting M3 mission endurance at [redacted] with a better but not ultimate material configuration.	No change since 2 Jan. Improved since 13 Dec. 1961	No additional confirmation of pump durability on engine endurance. Data [redacted] and RM strongly impressed with necessity to focus on hardware fix to be more compatible with 50 hour Mach 3 endur[illegible] capability, and to accelerate bench endurance testing.
2. Hydraulic System Flow Dynamics	Scope of problem felt to be narrowed from pump pulsation pressure peaks to interaction of sudden "on demand" requirements relative to pump controller response rate. Investigating this area, however, pressure peaks due to this interaction alone still insufficient to cause pipe rupture. No further pipe rupture during engine test reported since incorporation mechanical fittings and general system "beef-up."	Slightly improved but not confirmed.	Evident reduction in pipe rupture still not fully identified nor confirmed by engine endurance.
3. Plumbing - Mechanical Fittings	Hardware change-over to mechanical fittings proceeding satisfactorily. One mechanical fitting leak reported since 2 January.	Improved but not confirmed.	Evaluation on engine endurance required.

25X1A

Problem	Status Change Since 2 January 1962	Confidence Change Since 2 January 1962	Remarks Since 2 January 1962
A. Take-Off Performance			
1. Turbine Profile - Diffuser/Burner Case	Since 2 January a set-back occurred wherein an improved profile obtained by diffuser modification proved inconsistent. Since this set-back improvement has again been established with repeatability on two engines. Circumferential temperature profile has been reduced to two hot spots with a spread above nominal of 280°F. A radial profile tantamount to the ideal has been demonstrated. These improvements established on FX-113 and XB-1 with the diffuser/burner can configuration described on Attachment #1 for engines FX-112, 113, 114. Indications point to the isolation of this problem to areas of low compressor inlet temperature with high power settings.	Improved but not confirmed.	Improvement not yet confirmed by endurance. With continued repeatability using this latest interim configuration one level endurance is targeted for late February with engine FX-112 and/or FX-114. Since this interim fix may well cost performance, concurrent programs involving FX-113 and 111 will be run to evaluate performance and longer range production fixes.
2. Afterburner Performance	Although rig testing is outstanding for the improvement of spraybars and nozzles, no additional B-20 engine afterburning for resolution of the 5% augmentation deficiency has been run.	No change.	Engine test evaluation of the 5 ring sprayber awaits engine endurance so far precluded by the temperature profile problem.
3. Compressor Matching and Efficiency	Although rig testing evaluation of solid vs. honeycomb seals is in process, no real change in status as determined by engine performance evaluation is evident. Change in bleed bypass transition from Mach 2.6 down to 2.2 has extended the area of better than design calculated performance characteristic of bleeds open operation. This of course does not affect take-off.	No change.	Engine FX-113 (currently sound/good temperature profile problem) performance calibration required. A long range development problem involving rotor geometry.
4. Thrust Balance & Turbine Cooling Airflow	Improved 9th stage compressor seal has eliminated the necessity for thrust balance air bleed. Turbine cooling airflow still required.	Improved	Further evaluation required on FX-113.
5. Turbine Matching and Efficiency	No immediate change. A long lead time preliminary redesign has been initiated to recoup the 2% deficiency.	No change.	A long range development problem involving rotor geometry. Probably not effective before the 40th delivery engine.

Problem	Status Change Since 2 January 1962	Confidence Change Since 2 January 1962	Remarks Since 2 January 1962
C. Controls - Pratt and Whitney			
1. Valve and Piston Seizures	24 hours of integrated system sea level engine operation incorporating some hardened surfaces reveals no additional seizures. Insufficient production hardware deliveries have precluded further engine test.	Slightly Improved.	Initial production components have been delivered and are now on bench calibration prior to engine test evaluation.
2. Speed Schedule Inconsistency	The experience described above has demonstrated improvement.	Slight Improved.	Full evaluation of this problem and problem 1 above depends on engine mission environmental endurance using production components.
3. Transient Normals Control Instability	All existing experimental and production units now incorporate the redesigned valve felt to have been the crux of this problem. 24 hours of integrated system engine test utilizing 4 different component combinations has demonstrated repeatable stability.	Improved.	Additional demonstration of repeatable stability on engine endurance with production components required.
4. Casting Quality As Affecting Production Component Deliveries	Production component deliveries continue to slip.	Decreased.	Detailed report forthcoming.

25X1A

Problem	Status Change Since 2 January 1962	Significant Change Since 2 January 1962	Remarks Since 2 January 1962
D. Durability			
1. Turbine Blades	All engines now incorporate new heavy weight turbine blade vibration dampers. No blade failures experienced with new dampers. A slow but continuing effort underway to extend blade life by inhibiting corrosion.	Improved	A long range program to increase blade life. Further endurance testing required.
2. Compressor Rotor	Initial testing with engines FX-114 and 115 incorporating bolted rotor has progressed satisfactorily. Seal durability testing has not been initiated.	Little change	FX-115 to run program to check durability under surge conditions. FX-114 to run mission endurance with bolted rotor. XE-1 upon rebuild to run endurance with strain gaged bolted rotor to evaluate stress levels.
3. Turbine Rotor	Continued receiving inspection of light weight castalloy turbine discs surrounded for number 7 delivery engine has revealed inconsistency in terms of yield and ductility for the five 1st stage discs reviewed. Two three inspected out of a total of four 2nd stage discs show good properties.	No change	Delivery engines 1 through 6 receive the heavier Waspalloy discs which show good properties as indicated on previous summary dated 2 January 1962.
4. Compressor Air Seal Diaphragms	Redesign incorporated in engines FX-113, 114, 115. Insufficient testing to evaluate.	No change	Engine endurance required.
5. Gearbox	Titanium nozzle gearbox so far has accumulated 16 hours endurance at 1° continuous misalignment. Test program is being delayed by difficulty with airframe alternator.	Improved	1° misalignment has been accepted by Lockheed (indicated at 4 January meeting. Trouble with airframe alternator may or may not be indicative of reliability of airframe electrical power source.
6. General Engine	No change	No change	Engine endurance testing which is merely needed is expected to start in late February.
7. Engine Out-Board Injection	No change	No change	To be evaluated as part of flight test program.